

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

To:

see form PCT/ISA/220

PCT

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY (PCT Rule 43bis.1)

Date of mailing
(day/month/year) see form PCT/ISA/210 (second sheet)

Applicant's or agent's file reference
see form PCT/ISA/220

FOR FURTHER ACTION

See paragraph 2 below

| | | |
|--|--|--|
| International application No. PCT/JP2004/011310 | International filing date (day/month/year) 30.07.2004 | Priority date (day/month/year) 01.08.2003 |
|--|--|--|

International Patent Classification (IPC) or both national classification and IPC
G02F1/1335, G02F1/167

Applicant
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1. This opinion contains indications relating to the following items:

- Box No. I Basis of the opinion
- Box No. II Priority
- Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- Box No. IV Lack of unity of invention
- Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- Box No. VI Certain documents cited
- Box No. VII Certain defects in the international application
- Box No. VIII Certain observations on the international application

2. FURTHER ACTION

If a demand for international preliminary examination is made, this opinion will usually be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA"). However, this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of three months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

3. For further details, see notes to Form PCT/ISA/220.

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WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITYInternational application No.
PCT/JP2004/011310~~10/552578~~

Box No. I Basis of the opinion

1. With regard to the **language**, this opinion has been established on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.
 - This opinion has been established on the basis of a translation from the original language into the following language , which is the language of a translation furnished for the purposes of international search (under Rules 12.3 and 23.1(b)).
2. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application and necessary to the claimed invention, this opinion has been established on the basis of:
 - a. type of material:
 - a sequence listing
 - table(s) related to the sequence listing
 - b. format of material:
 - in written format
 - in computer readable form
 - c. time of filing/furnishing:
 - contained in the international application as filed.
 - filed together with the international application in computer readable form.
 - furnished subsequently to this Authority for the purposes of search.
3. In addition, in the case that more than one version or copy of a sequence listing and/or table relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
4. Additional comments:

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Box No. II Priority

1. The following document has not been furnished:

copy of the earlier application whose priority has been claimed (Rule 43bis.1 and 66.7(a)).
 translation of the earlier application whose priority has been claimed (Rule 43bis.1 and 66.7(b)).

Consequently it has not been possible to consider the validity of the priority claim. This opinion has nevertheless been established on the assumption that the relevant date is the claimed priority date.

2. This opinion has been established as if no priority had been claimed due to the fact that the priority claim has been found invalid (Rules 43bis.1 and 64.1). Thus for the purposes of this opinion, the international filing date indicated above is considered to be the relevant date.

3. Additional observations, if necessary:

Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

The questions whether the claimed invention appears to be novel, to involve an inventive step (to be non obvious), or to be industrially applicable have not been examined in respect of:

the entire international application,
 claims Nos. 7

because:

the said international application, or the said claims Nos. relate to the following subject matter which does not require an international preliminary examination (*specify*):
 the description, claims or drawings (*indicate particular elements below*) or said claims Nos. are so unclear that no meaningful opinion could be formed (*specify*):
 the claims, or said claims Nos. are so inadequately supported by the description that no meaningful opinion could be formed.
 no international search report has been established for the whole application or for said claims Nos. 7
 the nucleotide and/or amino acid sequence listing does not comply with the standard provided for in Annex C of the Administrative Instructions in that:

the written form has not been furnished

does not comply with the standard

the computer readable form has not been furnished

does not comply with the standard

the tables related to the nucleotide and/or amino acid sequence listing, if in computer readable form only, do not comply with the technical requirements provided for in Annex C-bis of the Administrative Instructions.

See separate sheet for further details

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**Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or
industrial applicability; citations and explanations supporting such statement**

1. Statement

| | | | |
|-------------------------------|------|--------|------------|
| Novelty (N) | Yes: | Claims | 1-6,8-12 |
| | No: | Claims | |
| Inventive step (IS) | Yes: | Claims | 4,5,8 |
| | No: | Claims | 1-3,6,9-12 |
| Industrial applicability (IA) | Yes: | Claims | 1-6,8-12 |
| | No: | Claims | |

2. Citations and explanations

see separate sheet

Re Item III.

Claim 7 is uncomprehensible and therefore no international search report has been established with respect to its subject-matter which consequently has also been omitted from the subject of the international preliminary examination (Rule 66.1(e) PCT). According to the wording of **claim 7**, *each pixel has a rectangular shape and said rectangular shape has a side located at its lower portion during image formation*. It is unclear to which entity the term "its" used therein refers. If it referred to the entity "each pixel" then the expression would not be logic since the location of "said side of said rectangular shape of said each pixel" can not be defined with respect to the entity "each pixel" itself. Furthermore, it is unclear what is meant by the term "lower" since this adjective should define a geometrical relation between two items which is however not the case in **claim 7**. Finally, the expression "*during image formation*" implies that said location of said side is dynamically changing which in the light of the description is further unclear. It is pointed out that **claim 7** could also not be interpreted in a meaningful sense in the light of the parts of the description (*p.45, l.17 - p.46, l.10*) considered to be relevant to the subject-matter of **claim 7**.

Re Item V.

1 The following documents are referred to in this communication:

D1 : US 2001/004279 A1 (MITSUI SEIICHI ET AL) 21 June 2001 (2001-06-21)
D2 : US 5 420 706 A (KONUMA TOSHIMITSU ET AL) 30 May 1995 (1995-05-30)
D3 : US 2003/048521 A1 (IKEDA TSUTOMU ET AL) 13 March 2003 (2003-03-13)
D4 : US 2002/171619 A1 (LOWE ANTHONY C ET AL) 21 November 2002 (2002-11-21)

2 INDEPENDENT CLAIM 1

2.1 The present application does not meet the criteria of Article 33(1) PCT, because the subject matter of **claim 1** does not involve an inventive step in the sense of Article 33(3)PCT.

2.1.1 Document D1 discloses (the references in parenthesis applying to this document):

a display apparatus (*figure 5, paragraphs [0053]-[0060]*), comprising:
a pair of oppositely disposed substrates (*figure 5(103,106)*)
at least one of which is a transparent substrate (*figure 5(103);paragraph [0057]*),
a display layer (*figure 5(105)*), disposed between said pair of substrates,
for being placed in an optical state switchable between a light transmission
state and a light interruption state (*paragraph [0060]*), for each pixel unit
(*figure 5(104a,104b)*),
a reflection surface (*figure 5(107), paragraphs [0044]*) provided on one of
said pair of substrates,
a scattering layer (*figure 5(101)*) disposed on the other substrate opposite to
the substrate provided with said reflection surface,
and a light absorption structure or a light reflection structure (*figure 5(111)*),
disposed at a boundary portion between adjacent pixels on said reflection
surface and embedded in said one of said pair of substrates.

2.1.2 The subject-matter of independent **claim 1** thus differs from the disclosure of D1 in that
said light absorption or light reflection structure is disposed *on* said one of
said pair of substrates whereas in the device of D1 said structure is disposed
or comprised *in* said one of said pair of substrates.

2.1.3 The technical effect thereby achieved is that light propagating towards said
light absorption or light reflection structure is not deflected by refraction at
the display layer - lower substrate interface.

2.1.4 The problem to be solved by the present invention may therefore be
regarded as how to avoid beam deflection in the device according to D1
caused by optical refraction at the boundary between said display layer and
said one of said pair of substrates.

2.1.5 However, the constructional change defined in **claim 1** is considered to
come within the scope of customary practice followed by persons skilled in
the art, especially as the advantages thus achieved can readily be foreseen.

In support of this view attention is drawn to document D2 (*see figure 2*), which suggests that a light absorption structure is arranged on top of a reflecting substrate in a similar device. Consequently, the skilled person would be aware of the possibility of modifying the display according to D1 in the manner specified in **claim 1**. Thus, the solution proposed in independent **claim 1** cannot be considered as being inventive (Article 33(3) PCT).

2.2 The same conclusion would be arrived at if D2 was taken as the starting point for the inventive step argument.

2.2.1 Document D2 discloses (the references in parenthesis applying to this document):

a display apparatus (*figure 2, col.3, l.16 - col.7, l.34*), comprising:
a pair of oppositely disposed substrates (*figure 2(100,100')*),
at least one of which is a transparent substrate (*col.6, l.62*),
a display layer (*figure 5(108)*), disposed between said pair of substrates,
for being placed in an optical state switchable between a light transmission state and a light interruption state (*col.2, l.54-65*), for each pixel unit (*figure 5(101,101')*),
and a light absorption structure or a light reflection structure (*figure 5(104)*) disposed at a boundary portion between adjacent pixels on one of said pair of substrates.

2.2.2 The subject-matter of independent **claim 1** thus differs from the disclosure of D2 in that :

the display apparatus as defined in **claim 1** further comprises a reflection surface or layer provided on one of said pair of substrates and a scattering layer disposed on the other substrate opposite to the substrate provided with said reflection surface or layer, said light absorption or a light reflection structure being disposed on said substrate provided with said reflection surface or layer.

2.2.3 The technical effect thereby achieved is that the display apparatus can operate in a reflection mode and that the viewing angle characteristics of the display apparatus are improved.

2.2.4 The problem to be solved by the present invention may therefore be regarded as how to realize the transmission-mode display apparatus disclosed in D2 as a reflective display and how to improve the visual angle characteristics (viewing angle) of the display apparatus disclosed in D2.

2.2.5 The provision of a reflector or reflection layer on one of a pair of substrates of a display device in order to realize a reflection-mode display device is common practice for those skilled in the art. Also the feature whereby a diffusion layer is provided on a substrate opposite to the one provided with a reflector in order to improve the viewing angle characteristics of a reflective display is a well known in the field of display technology.
An example of such a reflective display device is given in document D1 (see figure 5(107,101)). Consequently, the solution proposed in independent **claim 1** cannot be considered inventive (Article 33(3) PCT).

2.3 The present application does not meet the criteria of Article 33(1) PCT, because the subject matter of **claim 1** does also not involve an inventive step in the sense of Article 33(3)PCT with respect to the prior art known from documents D3 and D4.

2.3.1 Document D3 discloses (the references in parenthesis applying to this document):

a display apparatus (*figures 1, 5a, 5b, 9, 10, paragraphs [0032]-[0048],[0070],[0089]-[0106]*), comprising:
a pair of oppositely disposed substrates (*figures 5a,b(1,2)*)
at least one of which is a transparent substrate (*figures 5a,b(1)*),
a display layer (*figures 5a,b(4,5)*), disposed between said pair of substrates,
for being placed in an optical state switchable between a light transmission state and a light interruption state (*figures 5a,5b,9,10*), for each pixel (*figures 9,10*)),
a reflection surface (*figures 5a,b(6), 9(6,8), paragraphs [0043]*) provided on one of said pair of substrates,
and a light absorption structure or a light reflection structure (*figures 5a(5)*), disposed at a boundary portion between adjacent pixels (*figure 10*) on the substrate provided with said reflection surface.

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2.3.2 The subject-matter of independent **claim 1** differs from the disclosure of D3 in that the display apparatus defined in **claim 1** further comprises a scattering layer disposed on the other substrate opposite to the substrate provided with said reflection layer.

2.3.3 The technical effect thereby achieved is that the viewing angle characteristics of the display apparatus are improved.

2.3.4 The problem to be solved by the present invention may therefore be regarded as how to improve the visual angle characteristics (viewing angle) of the display apparatus disclosed in D3.

2.3.5 Once again, it is pointed out that the feature whereby a diffusion layer is provided on a substrate opposite to the one provided with a reflector in order to improve the viewing angle characteristics of a reflective display is a well known in the field of display technology. Furthermore, in view of D4 the solution proposed in **claim 1** of the present application cannot be considered as involving an inventive step (Article 33(3) PCT) for the following reasons: in paragraph [0075] of D4 it is mentioned that the reflected light is preferably diffused by a separate element. Since D4 and D3 relate to reflective electrophoretic displays the features disclosed in D3 and D4 would be combined by the skilled person, without exercise of any inventive skills in order to solve the problem posed. The proposed solution in independent **claim 1** as far as it can be understood thus cannot be considered inventive (Article 33(3) PCT).

2.4 On the other hand, it is conceded that none of the documents cited in the International Search Report discloses a device according to **claim 1** wherein said structure disposed at a boundary portion between adjacent pixels on said one of said pair of substrates provided with said reflection surface is explicitly a *light reflecting structure*, provided the feature that said structure could be a *light absorbing structure* is excluded.
In this case the claim could be restricted to an apparatus with a *light reflecting structure* and could result in new independent claim meeting the requirements of the PCT in respect of novelty and inventive step.

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3 DEPENDENT CLAIMS 2, 3, 6, 9-12

Dependent **claims 2, 3, 6, 9-12** as far as they can be understood do not contain any features which, in combination with the features of any claim to which they refer, meet the requirements of the PCT in respect of an inventive step (Article 33 (3) PCT).

4 DEPENDENT CLAIMS 4, 8

4.1 The combination of the features of dependent **claim 4** is neither known from, nor rendered obvious by, the available prior art. The reasons are as follows:

Depending on the scattering characteristics of the diffusing layer (angle Θ in equations of claim 4) the height of said light absorbing or reflecting structure, the pixel pitch and thickness of the display layer are adjusted according to the inequation given in **claim 4** in order to avoid blurring of a displayed image. In prior art document D2, depending on the scattering characteristics of the PDLC layer, the height and width of the light absorbing wall structure are adjusted in order to avoid blurring of a displayed image according to an inequation different from the one defined in **claim 4**. The pixel pitch is not adjusted according to the teaching of D2.

The other prior art documents cited in the International Search Report do not mention the optimization of the light absorbing wall structure (black matrix) at all.

4.2 The combination of the features of dependent **claim 8** is neither known from, nor rendered obvious by, the available prior art. However, the specific feature combination of **claim 8** whereby said structure disposed at a boundary portion between adjacent pixels on said one of said pair of substrates provided with said reflection surface is a *light absorbing structure* having a refractive index larger than that of said display layer is considered to be not supported by the description and thus the requirements of Article 6 PCT are not met.